Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for determining a geometric property of a test object, the method comprising:

interferometrically profiling a first surface of the test object with respect to a first datum surface;

interferometrically profiling a second surface of the test object ~~in a second coordinate system~~ with respect to a second datum surface different from the first datum surface;

~~providing~~ determining a spatial relationship between the first and second datum surfaces based on at least one interferometric displacement measurement; and

calculating the geometric property based on the interferometrically profiled surfaces and the spatial relationship between the first and second datum surfaces.

2. (Original) The method of claim 1, wherein the interferometric profiling of the first surface provides a distance to each of a plurality points on the first surface from a corresponding point on the first datum surface.

3. (Currently Amended) The method of claim 2, wherein the interferometric profiling of the second surface provides a distance to each of a plurality points on the ~~first~~ second surface from a corresponding point on the ~~first~~ second datum surface.

4. (Original) The method of claim 1, wherein the first datum surface is a portion of a plane.

5. (Original) The method of claim 1, wherein the first datum surface is curved.

6. (Original) The method of claim 1, wherein the first datum surface has a structured profile.

7. (Original) The method of claim 1, wherein the first surface is spaced from the second surface.

8. (Original) The method of claim 1, wherein the first and second surfaces correspond to opposite faces of the test object.

9. (Original) The method of claim 1, wherein the first and second surfaces correspond to adjacent faces of the test object.

10. (Original) The method of claim 1, wherein the first and second surfaces are adjacent faces separated by a step height.

11. (Original) The method of claim 1, wherein the first and second surfaces are displaced from one another by a distance greater than a range of the interferometric profiling of the first surface and greater than a range of the interferometric profiling of the second surface.

12. (Original) The method of claim 1, wherein the interferometric profiling of the first surface comprises directing electromagnetic radiation to the first surface along a first direction and the interferometric profiling of the second surface comprises directing electromagnetic radiation to the second surface along a second direction different from the first direction.

13. (Original) The method of claim 1, wherein the interferometric profiling of the first surface comprises positioning the test object relative to an interferometry system and the interferometric profiling of the second surface comprises repositioning the test object relative to at least one component of the interferometry system.

14. (Original) The method of claim 13, wherein the repositioning of the test object relative to the interferometry system comprises moving the test object.

15. (Original) The method of claim 13, wherein the repositioning of the test object relative to the interferometry system comprises moving the at least one component of the interferometry system.

16. (Original) The method of claim 1, wherein the relationship between the first and second datum surfaces is defined by a distance between corresponding reference points on the first and second datum surfaces and two angles defining a relative orientation of the first and second datum surfaces.

17. Canceled.

18. Canceled.

19. Canceled.

20. Canceled.

21. (Original) The method of claim 20, further comprising determining the spatial relationship based on at least one interferometric distance measurement and an initial calibration.

22. (Original) The method of claim 20, further comprising adjusting at least one of the first and second datum surfaces to accommodate the interferometric profiling of the first and second surfaces of the test object and interferometrically measuring the adjustment of the at least one of the first and second datum surfaces to determine the spatial relationship between the first and second datum surfaces.

23. (Currently Amended) The method of claim 15, further comprising interferometrically measuring the movement of the at least one component of the interferometry system to determine the spatial relationship between the first and second datum surfaces and provide the interferometric displacement measurement.

24. (Currently Amended) The method of claim ~~17~~ 25, wherein the determining of the spatial relationship further comprises:

~~interferometrically profiling a first surface of a initialization artifact with respect to the first datum surface;~~

~~interferometrically profiling a second surface of the initialization artifact with respect to the second datum surface;~~

~~calculating an initial spatial relationship between the first and second datum surfaces based on at least the profiled surfaces of the initialization artifact;~~

~~adjusting the first and second datum surfaces to accommodate the first and second surfaces of the test object; and~~

interferometrically measuring at least one displacement corresponding to the adjustment of the first and second datum surfaces.

25. (Currently Amended) ~~The method of claim 24~~ A method for determining a geometric property of a test object, the method comprising:

interferometrically profiling a first surface of the test object with respect to a first datum surface;

interferometrically profiling a second surface of the test object with respect to a second datum surface different from the first datum surface;

determining a spatial relationship between the first and second datum surfaces; and

calculating the geometric property based on the interferometrically profiled surfaces and the spatial relationship between the first and second datum surfaces,

wherein the determining of the spatial relationship comprises:

interferometrically profiling a first surface of a initialization artifact with respect to the first datum surface;

interferometrically profiling a second surface of the initialization artifact with respect to the second datum surface;

calculating an initial spatial relationship between the first and second datum surfaces based on at least the profiled surfaces of the initialization artifact; and

adjusting the first and second datum surfaces to accommodate the first and second surfaces of the test object,

wherein the first and second surfaces of the initialization artifact are the front and back of a common interface.

26. (Currently Amended) The method of claim 24 25, further comprising providing at least one calibrated dimension for the initialization artifact, and wherein the calculation of the initial relationship is based on the profiled surfaces of the initialization artifact and the at least one calibrated dimension.

27. (Original) The method of claim 1, wherein the geometric property is flatness of the test object.

28. (Original) The method of claim 1, wherein the geometric property is thickness of the test object.

29. (Original) The method of claim 1, wherein the geometric property is parallelism of the test object.

30. (Original) The method of claim 1, wherein the geometric property is a step height.

31. (Original) The method of claim 1, wherein the geometric property is angular orientation of the first surface relative to the second surfaces.

32. (Original) The method of claim 31, wherein the geometric property is perpendicularity of the first and second surfaces.

33. (Original) The method of claim 1, wherein the geometric property is roundness of the test object.

34. (Original) The method of claim 1, wherein the geometric property is defined by positions in a common coordinate system of a plurality of points on the first surface and a plurality of points on the second surface.

35. (Original) The method of claim 1, wherein the interferometric profiling of at least one of the first and second surfaces comprises performing scanning, white light interferometry.

36. (Original) The method of claim 1, wherein the interferometric profiling of at least one of the first and second surfaces comprises performing infrared, scanning interferometry.

37. (Original) The method of claim 1, wherein the interferometric profiling of at least one of the first and second surfaces comprises performing scanning MESA interferometry.

38. (Original) The method of claim 1, wherein the interferometric profiling of at least one of the first and second surfaces comprises performing scanning, grazing-incidence interferometry.

39. (Original) The method of claim 1, wherein the interferometric profiling of at least one of the first and second surfaces comprises performing multiple wavelength interferometry.

40. Canceled.

41. Canceled.

42. (Currently Amended) An apparatus for determining a geometric property of a test object, the method apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface; and

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces; and

a displacement measuring interferometer positioned to measure the spatial relationship between the first and second datum surfaces.

43. (Original) The apparatus of claim 42, wherein the interferometric profiling system includes a mount for supporting the test object, wherein the mount is adjustable between a first position for exposing the first surface of the test object and defining the datum surface and a

second position for exposing the second surface of the test object and defining the second datum surface.

44. (Currently Amended) ~~The apparatus of claim 42,~~ An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface; and

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces.

wherein the interferometric profiling system comprises an interferometric optical profiler having a first viewing port for viewing the first surface of the test object and a second viewing port for viewing the second surface of the test object, wherein the first and second surfaces correspond to different sides of the test object.

45. (Original) The apparatus of claim 44, wherein the optical profiler comprises a first camera positioned to record a field of view for the first viewing port and a second camera positioned to record a field of view for the second viewing port.

46. (Original) The apparatus of claim 44, wherein the optical profiler comprises a camera positioned to record a split field of view for the first and second viewing ports.

47. (Original) The apparatus of claim 44, wherein the optical profiler comprises at least one source of EM radiation.

48. (Currently Amended) ~~The apparatus of claim 47,~~ An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface; and

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces,

wherein the interferometric profiling system comprises an interferometric optical profiler having a first viewing port for viewing the first surface of the test object and a second viewing port for viewing the second surface of the test object, and

wherein the optical profiler ~~further comprises a first optic positioned~~ is configured to direct a first portion of ~~the~~ EM radiation from a source towards the first viewing port, ~~and~~ direct a second portion of the EM radiation towards the second viewing ~~ports~~ port, and direct at least one additional portion of the EM radiation within the optical profiler.

49. (Currently Amended) The apparatus of claim 48, wherein the ~~first optic is~~ optical profiler comprises a beam splitting optic positioned to reflect the first portion of the EM radiation towards the first viewing port, reflect the second portion of the EM radiation towards the second viewing port, and transmit the at least one additional portion of the incident EM radiation through the beam splitting optic.

50. (Original) The apparatus of claim 49, wherein the optical profiler further includes a reflective reference surface positioned to receive the at least one additional portion of the incident EM radiation transmitted through the beam splitting optic.

51. (Original) The apparatus of claim 50, wherein the optical profiler further includes a transducer coupled to the reflective reference surface for scanning the position of the reflective reference surface.

52. (Original) The apparatus of claim 49, wherein the optical profiler further comprises a first viewing port optic supported by a first movable stage, the first viewing port optic positioned to direct at least one part of the first portion of the EM radiation towards the first surface of the test object and the first movable stage adjustable to accommodate the interferometric profiling of the first surface of the test object.

53. (Original) The apparatus of claim 52, wherein the optical profiler further comprises a second viewing port optic supported by a second movable stage, the second viewing port optic positioned to direct at least one part of the second portion of the EM radiation towards the second surface of the test object and the second movable stage adjustable to accommodate the interferometric profiling of the second surface of the test object.

54. (Original) The apparatus of claim 52, wherein the first reflective optic is a roof mirror.

55. (Original) The apparatus of claim 52, wherein the optical profiler further includes a first fold mirror for further directing the at least one part of the first portion of the EM radiation towards the first surface of the test object.

56. (Original) The apparatus of claim 53 further comprising a displacement measuring interferometer positioned to measure changes in the spatial relationship between the first and second datum surfaces caused by at least one of an adjustment to the first movable stage and an adjustment to the second movable stage.

57. (Currently Amended) ~~The apparatus of claim 42,~~ An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface; and

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces,

wherein the interferometric profiling system comprises a first interferometric optical profiler for viewing the first surface of the test object and a second interferometric optical profiler for viewing the second surface of the test object.

58. (Original) The apparatus of claim 57, wherein the first optical profiler is movable relative to the second optical profiler to adjust the spatial relationship between the first and second datum surfaces.

59. (Original) The apparatus of claim 58, further comprising a displacement measuring interferometer positioned to measure changes in the spatial relationship between the first and second datum surfaces caused by relative movement of the first and second optical profilers.

60. (Original) The apparatus of claim 42, wherein the interferometric profiling system comprises a moveable stage adjustable from a first position defining the first datum surface to a second position defining the second datum surface.

61. Canceled.

62. (Currently Amended) The apparatus of claim 61 64, wherein the electronic processor determines the spatial relationship between the first and second datum surfaces based on interferometric profiling measurements of the first and second surfaces of the gauge object provided by the first and second optical profilers.

63. (Currently Amended) The apparatus of claim 61 64, wherein the gauge object has at least one calibrated dimension and wherein the electronic processor determines the spatial relationship between the first and second datum surfaces based on interferometric profiling measurements of the first and second surfaces of the gauge object provided by the first and second optical profilers and the at least one calibrated dimension.

64. (Currently Amended) The apparatus of claim 61, An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface;

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces; and

a gauge object having first and second surfaces, the first surface being positioned to be profiled by the interferometric profiling system with respect to the first datum surface and the second surface being positioned to be profiled by the interferometric profiling system with respect to the second datum surface,

wherein the gauge object is positioned to be in a field of view of the interferometric profiling system during interferometric profiling of the test object.

65. Canceled.

66. (Currently Amended) ~~The apparatus of claim 42,~~ An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface different from the first datum surface; and

an electronic processor coupled to the interferometric profiling system, wherein during operation the electronic processor calculates the geometric property based on the interferometrically profiled surfaces and a spatial relationship between the first and second datum surfaces;

wherein the electronic processor uses at least one value indicative of PCOR dispersion in the interferometric profiling system and the test object to calculate the geometric property.

67. (Original) An apparatus for determining a geometric property of a test object, the apparatus comprising:

an interferometric profiling system which during operation interferometrically profiles a first surface of the test object with respect to a first datum surface and interferometrically profiles a second surface of the test object with respect to a second datum surface, wherein the interferometric profiling system comprises at least one movable stage for adjusting the position of the first datum surface and the second datum surface;

a displacement measuring interferometer positioned to measure a change in a relative position of the first and second datum surface caused by an adjustment to the at least one movable stage; and

an electronic processor coupled to the interferometric profiling system and the displacement measuring interferometer, wherein during operation the electronic processor

calculates the geometric property based on the interferometrically profiled surfaces and the relative position of the first and second datum surfaces.

68. (Original) The apparatus of claim 67, wherein the interferometric profiling system comprises a second moveable stage, and wherein during operation the first-mentioned movable stage adjusts the position of the first datum surface and the second movable stage adjusts the position of the second datum surface.

69. (Original) The apparatus of claim 67, wherein the at least one movable stage comprises a first movable stage adjustable from a first position defining the first datum surface to a second position defining the second datum surface.

70. (Original) The apparatus of claim 67, wherein the displacement measuring interferometer provides multiple axes of measurement.

71. (Original) The apparatus of claim 67, wherein the interferometric profiling system is a scanning interferometric profiling system using infrared wavelengths.

72. Canceled.

73. (Original) A method for determining a geometric property of a test object, the method comprising:

interferometrically profiling a first surface of the test object with respect to a first datum surface;

interferometrically profiling a second surface of the test object with respect to a second datum surface different from the first datum surface;

determining a spatial relationship between the interferometrically profiled surfaces which accounts for PCOR dispersion; and

calculating the geometric property based on the interferometrically profiled surfaces and the spatial relationship.

74. (Original) The method of claim 1, wherein the test object is partially transparent.

75. (Original) The method of claim 74, wherein the geometric property is determined by positions of a plurality of point on a front surface of the test object relative to positions of a plurality of points on a back surface of the test object

76. (Currently Amended) ~~The method of claim 1,~~ A method for determining a geometric property of a test object, the method comprising:
interferometrically profiling a first surface of the test object with respect to a first datum surface;
interferometrically profiling a second surface of the test object with respect to a second datum surface different from the first datum surface;
providing a spatial relationship between the first and second datum surfaces based on at least one interferometric displacement measurement; and
calculating the geometric property based on the interferometrically profiled surfaces and the spatial relationship between the first and second datum surfaces,
wherein the first and second surfaces of the test object are interferometrically profiled from a common side and the first and second datum surfaces are spaced from one another by a distance greater than a profiling range η of an interferometry system used for the interferometric profiling steps.

77. (Currently Amended) The method of claim 76, wherein the interferometry system used for the interferometric profiling steps comprises a reference object having a partially reflective, first surface and a reflective, second surface, the first surface defining a position of the first datum surface and the second surface defining a position of the second datum surface.

78. (Original) The method of claim 77, wherein the relationship is defined by the spatial separation between the first and second surfaces of the reference object.

79. (Currently Amended) An optical profiling system comprising:

a broadband source;

a scanning interferometer which during operation separates input light into a first wavefront and a second wavefront, directs a the first wavefront along a reference path including a partially reflective first surface and a reflective second surface and a the second wavefront along a measurement path contacting a measurement object, and, after the second wavefront contacts the measurement object, combines the wavefronts to produce an optical interference pattern;

a detector producing interference data in response to the optical interference pattern;

an electronic processor coupled to the detector for analyzing the interference data

a scanning controller coupled to the scanning interferometer and the electronic processor, wherein during operation the scanning controller causes the scanning interferometer to adjust the position of the first and second surfaces.

80. (Currently Amended) The interferometry system of claim 79, wherein the partially reflective first surface of the scanning interferometer defines a position of a first datum surface and the reflective second surface defines a position of a second datum surface, and wherein during operation the electronic processor calculates a geometric property of the test object based on the interference data and a relationship between the first and second datum surfaces.